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Developing Mathematical Intuitation in Students

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ANNOTATION

What can be done to develop mathematical intuition in students, a systematic study of each branch of mathematics, a deep understanding of the science of mathematics, the role of mathematical intuition in the full understanding of its axioms, theorems and other concepts.

KEYWORDS: mathematical intuition, axiom, theorem, intuitive ability, higher level equation, Cardano method.

The President of the Republic of Uzbekistan Sh.M.Mirziyoev [1] expressed the idea that the strength of the knowledge and skills of future professionals, the comprehensive study of their knowledge is of great importance.

Resolutions of the President of the Republic of Uzbekistan Sh.M.Mirziyoev No. PP-4708 of May 7, 2020 "On measures to improve the quality of education and development of scientific research in the field of mathematics" are being implemented in the Republic of Uzbekistan plays an important role in education reform. The basis of socio-economic, spiritual and cultural development of society today depends on the level of knowledge and skills of young people studying in educational institutions.

The tasks set for the development of education serve to improve this area in accordance with the requirements of the time. In order to meet the requirements of state educational standards, it is necessary to increase students' mathematical knowledge and skills. In solving this task, it is important to develop mathematical intuition in students.

Mathematical intuition also plays a small role in understanding the axioms, theorems and other concepts in a deep understanding of the science of mathematics. Without intuition, the reduced science becomes only formal, informative.

Only a student who has sensed and understood mathematical formulas can apply them to real-life examples and problems.

To the question of what should be done to develop mathematical intuition in students, we recommend working with students in the following areas.

1. Systematically organize each branch of mathematics. At the same time, the teacher should explain each concept in simple language before giving it with strict definitions and proofs.
2. Students' intuitive abilities in solving and analyzing a specific example or problem are revealed and developed.

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For example: the first pipe fills the pool in 2 hours, the second pipe in 4 hours. The following considerations can be made in deciding how many hours the pool will charge if both wells are open.

The capacity of pipe 1 is greater than that of pipe 2.Since both pipes are open, the pool should be filled in less than 2 hours. (why?)

If the power of pipe 2 was the same as that of pipe 1, the pipe would flow in 1 hour. (why?)

So, the answer to the question should be between 1 and 2 hours.

After making such comments, you can jump to solving the problem.

When students are faced with a new topic and a new example, they need to be given the opportunity to think for themselves, that is, to create a problem situation and encourage them to use their little mental capacity to help them choose the right path. We believe that in solving examples and problems, we should not waste time in choosing the problem, the conditions of the example, their solutions.

For example, at what value of m is the sum of the squares of the roots of the quadratic equation the largest? Students should be encouraged to think before solving this example. Given that the example belongs to the quadratic equation, for the sum of the squares of the roots of the quadratic equation

$$x_1^2 + x_2^2 = p^2 - 2q$$

the formula should be made so that few readers can either recite or quote it. In the example above,. In that case $p = -(m-1)$, $q = m^2 - 1{,}5$.

$$x_1^2 + x_2^2 = (-(m-1))^2 - 2(m^2 - 1{,}5)$$

Students are involved in simplifying this expression.

$$m^2 - 2m + 1 = 2m^2 + 3 = -m^2 - 2m + 4$$

Here it is stated when this expression reaches its maximum value:

a) (error intuition) The reader looks for the roots of the quadratic equation $-m^2 - 2m + 4$ =0.

b) (correct intuition) The reader separates the fiber square from the expression $-m^2 - 2m + 4$ =0.

$$-(m^2 + 2m + 1) - 1 + 4 = -(m+1)^2 + 3$$

Also in the analysis of the last expression:

a) (error intuition);

b) (Correct intuition).

Since the expression (m + 1) is squared, the minimum value of $(m + 1)^2$ is 0. After considering that the divisor reaches the smallest value and the difference reaches the largest value, the answer is m = -1. Students look for the root of an equation, relying on intuition in their search for solutions to higher-level equations. For example, $x^3 - 9x^2 + 21x - 5 = 0$

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let's look for the root of the equation in the Cardano method.

Solution: We make a substitution, $x = y - \frac{a}{3}$, $a = -9$, $x = y + 3$ in which case if we take the notation to the equation, the limit x^2 disappears, that is:

$$(y+3)^3 - 9(y+3)^2 + 21(y+3) - 5 = 0$$

$y^3 - 6y + 4 = 0$ we have a cubic equation in the form of: $p = -6, \quad q = 4$

1) $\Delta = 0$ the equation has 3 real and 2 symmetric roots;

2) $\Delta > 0$ the equation has 1 real and 2 complex roots;

$$\Delta = \left(\frac{q}{2}\right)^2 + \left(\frac{p}{3}\right)^3 = \frac{4^2}{4} + \left(\frac{-6}{3}\right)^3 = -4 < 0$$

$$\Delta = \sqrt[3]{-\frac{q}{2} + \sqrt{\left(\frac{q}{2}\right)^2 + \left(\frac{p}{3}\right)^3}} = \sqrt[3]{-2 + \sqrt{4}} = \sqrt[3]{-2 + 2i}$$

$$-2 + 2i = 2\sqrt{2}\left(\cos\frac{3\pi}{4} + i\sin\frac{3\pi}{4}\right)$$

$$u_1 = \sqrt[3]{2\sqrt{2}\left(\cos\frac{3\pi}{4} + i\sin\frac{3\pi}{4}\right)} = \sqrt{2}\left(\cos\frac{\pi}{4} + i\sin\frac{\pi}{4}\right) = 1 + i$$

$$v_1 = \sqrt[3]{2\sqrt{2}\left(\cos\frac{3\pi}{4} - i\sin\frac{3\pi}{4}\right)} = \sqrt{2}\left(\cos\frac{\pi}{4} - i\sin\frac{\pi}{4}\right) = 1 - i$$

$$y_1 = u_1 + v_1 = 2,\ y_1 = u_2 + v_2 = -\frac{1}{2}(u_1 + v_1) + \frac{\sqrt{3}}{2}i(u_1 - v_1) = -1 - \sqrt{3},$$

$y_3 = u_3 + v_3 = -\frac{1}{2}(u_1 + v_1) - \frac{\sqrt{3}}{2}i(u_1 - v_1) = -1 + \sqrt{3}$ from this we find the root of the equation, $x_1 = 5, \quad x_2 = 2 - \sqrt{3}, \quad x_2 = 2 + \sqrt{3}$.

With the development of science and technology, and the application of computers to life, it is important to develop the intuitive, creative thinking skills of young people, to help them control the computer and maintain its superiority.

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